WHAT IS CLAIMED IS

1. An apparatus for measuring a jitter of a signal under measurement comprising:

a phase error estimator for obtaining sampling points close to corresponding zero-crossing points of the signal under measurement as approximated zero-crossing points, for obtaining phase errors between the approximated zero-crossing points and the corresponding zero-crossing points of the signal under measurement, and for outputting a zero crossing phase error data sequence; and

a period jitter estimator for obtaining a period jitter sequence of the signal under measurement from the phase error data sequence.

2. The apparatus for measuring a jitter of a signal under measurement according to claim 1 further comprising band-pass filter means provided at front stage of said phase error estimator to which the signal under measurement is inputted for passing therethrough predetermined frequency components of the signal under measurement, and for supplying the predetermined frequency components to said phase error estimator.

3. The apparatus for measuring a jitter of a signal under measurement according to claim 2 further comprising a cycle-to-cycle period jitter estimator to which the period jitter sequence is inputted for calculating its difference sequence, and for outputting a cycle-to-cycle period jitter sequence.

4. The apparatus for measuring a jitter of a signal under measurement

according to claim 2 or 3 further comprising a jitter detector to which the jitter sequence is inputted for obtaining a jitter value of the signal under measurement from the jitter sequence.

5. The apparatus for measuring a jitter of a signal under measurement according to claim 2 or 3 wherein said phase error estimator comprising:

a zero-crossing sampler to which the signal under measurement that has passed through said band-pass filter means is inputted for sampling only waveform data around zero-crossing timings of the inputted signal, and for outputting an approximated zero-crossing data sequence; and

a phase error calculator to which the approximated zero-crossing data sequence is inputted for calculating the phase errors between the approximated zero-crossing points and the corresponding zero-crossing points of the signal under measurement from the approximated zero-crossing data, and for outputting the zero-crossing phase error data sequence.

6. The apparatus for measuring a jitter of a signal under measurement according to claim 5 wherein said phase error estimator further comprising an analytic signal transformer to which the signal under measurement that has passed through said band-pass filter means is inputted for transforming the inputted signal under measurement into a complex analytic signal, and for supplying the complex analytic signal to said zero-crossing sampler.

7. The apparatus for measuring a jitter of a signal under measurement according to claim 2 or 3 wherein said period jitter estimator comprising:

an instantaneous period estimator to which the zero-crossing phase error data sequence is inputted for obtaining an instantaneous period sequence

of the signal under measurement from intervals between the approximated zero-crossing points and from the zero-crossing phase error data;

a fundamental period subtractor for obtaining respective differences between the instantaneous periods and a fundamental period of the signal under measurement, and for outputting an uncorrected period jitter sequence; and

a period jitter sequence corrector for multiplying the uncorrected period jitter sequence by a ratio of the fundamental period of the signal under measurement and the intervals between the zero-crossing points to perform a correction, and to obtain the period jitter sequence.

8. The apparatus for measuring a jitter of a signal under measurement according to claim 2 or 3 wherein said period jitter estimator comprising:

an instantaneous angular frequency estimator to which the zero-crossing phase error data sequence is inputted for obtaining an instantaneous angular frequency sequence of the signal under measurement from intervals of the approximated zero-crossing points and from the zero-crossing phase error data; and

a period jitter calculator for obtaining the period jitter sequence from the instantaneous angular frequency sequence and the fundamental period.

9. The apparatus for measuring a jitter of a signal under measurement according to claim 2 or 3 wherein said band-pass filter comprising:

a time domain to frequency domain transformer for transforming the signal under measurement into a signal in frequency domain;

a bandwidth limiter for extracting only components around a fundamental frequency of the signal under measurement from an output of

said time domain to frequency domain transformer; and

a frequency domain to time domain transformer for inverse-transforming an output of said bandwidth limiter into a signal in time domain.

10. The apparatus for measuring a jitter of a signal under measurement according to claim 2 or 3 further comprising a waveform clipper to which the signal under measurement is inputted for removing amplitude modulation components of the signal under measurement in the state that phase modulation components of the signal under measurement are retained.

11. The apparatus for measuring a jitter of a signal under measurement according to claim 4 wherein said jitter detector is a peak-to-peak detector for obtaining a difference between the maximum value and the minimum value of a supplied jitter sequence.

12. The apparatus for measuring a jitter of a signal under measurement according to claim 4 wherein said jitter detector is an RMS detector for obtaining a root-mean-square value (RMS value) of a supplied jitter sequence.

13. The apparatus for measuring a jitter of a signal under measurement according to claim 4 wherein said jitter detector is a histogram estimator for obtaining a histogram of a supplied jitter sequence.

14. The apparatus for measuring a jitter of a signal under measurement according to claim 2 or 3 further comprising a fundamental period estimator to which the signal under measurement is inputted for obtaining a

fundamental period of the signal under measurement.

15. The apparatus for measuring a jitter of a signal under measurement according to claim 7 wherein said period jitter estimator further comprising a low-pass filter to which the period jitter sequence is inputted for removing high-frequency components of the period jitter sequence.

16. The apparatus for measuring a jitter of a signal under measurement according to claim 8 wherein said period jitter estimator further comprising a low-pass filter to which the period jitter sequence is inputted for removing high-frequency components of the period jitter sequence.

17. A method of measuring a jitter of a signal under measurement comprising:

a step of passing predetermined frequency components of the signal under measurement to band-limit the signal under measurement;

a step of obtaining sampling points close to corresponding zero-crossing points of the band-limited signal as approximated zero-crossing points, obtaining phase errors between the approximated zero-crossing points and the corresponding zero-crossing points of the signal under measurement, and estimating a zero crossing phase error data sequence; and

a step of obtaining a period jitter sequence of the signal under measurement from the phase error data sequence.

18. The method of measuring a jitter of a signal under measurement according to claim 17 further including a step of calculating a difference sequence of the period jitter sequence to obtain a cycle-to-cycle period jitter

sequence of the signal under measurement.

19. The method of measuring a jitter of a signal under measurement according to claim 17 or 18 further including a step of obtaining a jitter value of the signal under measurement from the jitter sequence.

20. The method of measuring a jitter of a signal under measurement according to claim 17 or 18 wherein said step of estimating the phase error data sequence comprising:

a step of sampling waveform data around zero-crossing timings of the band-limited signal, and estimating an approximated zero-crossing data sequence; and

a step of calculating phase errors between the approximated zero-crossing points and the corresponding zero-crossing points of the signal under measurement from the approximated zero-crossing data sequence, and obtaining the zero-crossing phase error data sequence.

21. The method of measuring a jitter of a signal under measurement according to claim 17 or 18 wherein said step of estimating the phase error data sequence comprising:

a step of transforming the band-limited signal into a complex analytic signal;

a step of sampling the analytic signal waveform data close to zero-crossing timings of the transformed analytic signal to estimate an approximated zero-crossing complex data sequence; and

a step of calculating phase errors between the approximated zero-crossing points and the corresponding zero-crossing points of the signal

under measurement from the approximated zero-crossing complex data sequence, and obtaining the zero-crossing phase error data sequence.

22. The method of measuring a jitter of a signal under measurement according to claim 17 or 18 wherein said step of estimating the period jitter sequence comprising:

a step of obtaining an instantaneous period sequence of the signal under measurement from intervals between the approximated zero-crossing points and from the zero-crossing phase error data;

a step of calculating differences between the instantaneous periods and the fundamental period of the signal under measurement, and obtaining an uncorrected period jitter sequence; and

a step of multiplying the uncorrected period jitter sequence by a ratio of the fundamental period of the signal under measurement and the intervals between the approximated zero-crossing points to correct the uncorrected period jitter sequence.

23. The method of measuring a jitter of a signal under measurement according to claim 17 or 18 wherein said step of obtaining the period jitter sequence comprising:

a step of obtaining an instantaneous angular frequency sequence of the signal under measurement from intervals of the approximated zero-crossing points and from the zero-crossing phase error data; and

a step of obtaining a period jitter sequence from the instantaneous angular frequency sequence and the fundamental period of the signal under measurement.

24. The method of measuring a jitter of a signal under measurement according to claim 17 or 18 wherein said step of band-limiting the signal under measurement comprising:

a step of transforming the signal under measurement into a spectrum signal in frequency domain;

a step of extracting only components around a fundamental frequency of the spectrum signal; and

a step of inverse-transforming the spectrum signal having only the fundamental frequency component into a signal in time domain.

25. The method of measuring a jitter of a signal under measurement according to claim 17 or 18 wherein said step of band-limiting the signal under measurement comprising:

a step of storing the signal under measurement in a buffer memory;

a step of extracting the signal in the sequential order from the buffer memory as a partial signal such that each partial signal being extracted is partially overlapped with the partial signal extracted just before;

a step of multiplying each extracted partial signal by a window function;

a step of transforming each partial signal multiplied by the window function into a spectrum signal in frequency domain;

a step of extracting only components around a fundamental frequency of the signal under measurement from the spectrum signal;

a step of inverse-transforming the spectrum signal having only the fundamental frequency component into a signal in time domain; and

a step of multiplying the inverse-transformed signal in time domain by an inverse number of the window function to obtain the band-limited signal.

26. The method of measuring a jitter of a signal under measurement according to claim 17 or 18 further including a step of performing a waveform clipping of the signal under measurement to remove amplitude modulation components of the signal under measurement in the state that phase modulation components of the signal under measurement are retained.

27. The method of measuring a jitter of a signal under measurement according to claim 17 or 18 further including a step of obtaining a fundamental period of the signal under measurement.

28. The method of measuring a jitter of a signal under measurement according to claim 19 wherein said step of obtaining the jitter value is a step of obtaining a difference between the maximum value and the minimum value of the jitter sequence, and calculating a peak-to-peak value.

29. The method of measuring a jitter of a signal under measurement according to claim 19 wherein said step of obtaining the jitter value is a step of obtaining a root-mean-square value of the jitter sequence, and calculating an RMS value.

30. The method of measuring a jitter of a signal under measurement according to claim 19 wherein said step of obtaining the jitter value is a step of obtaining a histogram data of the jitter sequence.

31. The method of measuring a jitter of a signal under measurement according to claim 22 wherein said step of estimating the period jitter further

including a step of removing high frequency components in the period jitter sequence.